ACE

MAG Level 2 HDF, 16-sec Vectors

97-045A-09A

The data set files are binary and in HDF format. Each file covers 27 days of data with filename format mag_data_16sec_BBBB.hdf where BBBB is the four-digit Bartel interval.

The CD-Write Once KD and KW numbers along with the corresponding time spans are as follows:

KD#	KW#	TIME SPAN
KD022373	KW000202	12/27/1997 - 07/01/2000
KD022374	KW000203	07/02/2000 - 11/12/2002
KD022375	KW000204	11/13/2002 - 03/12/2004

ACE

MAG Level 2 HDF, 4-min Vectors

97-045A-09B

The data set files are binary and in HDF format. Each file covers 27 days of data with filename format mag_data_4min_BBBB.hdf where BBBB is the four-digit Bartel interval. This data set also now includes the same data in one-year blocks in the files mag_data_4min_yearYYYY.hdf for YYYY = 1997 to 2004. Total date coverage is the same as for the 27-day files.

The CD-Write Once KD and KW number along with the corresponding time span Is as follows:

KD#	KW#	TIME SPAN
KD022376	KW000205	12/27/1997 - 03/12/2004

ACE

MAG Level 2 HDF, 1-hour Vectors

97-045A-09C

The data set files are binary and in HDF format. Each file covers 27 days of data with filename format mag_data_1hr_BBBB.hdf where BBBB is the four-digit Bartel interval.

The CD-Write Once KD and KW number along with the corresponding time span is as follows:

KD#	KW#	TIME SPAN
KD022377	KW000206	12/27/1997 - 03/12/2004

ACE

MAG Level 2 HDF, 1-day Scalar

97-045A-09D

The data set files are binary and in HDF format. Each file covers 27 days of data with filename format mag_data_1day_BBBB.hdf where BBBB is the four-digit Bartel interval.

The CD-Write Once KD and KW number along with the corresponding time span is as follows:

KD#	KW#	TIME SPAN
KD022378	KW000207	12/27/1997 - 03/12/2004

ACE

MAG Level 2 HDF, 27-day Scalar

97-045A-09E

This data set consist of two binary files in HDF format. Each file contains averages for one Bartel interval of 27 days with filename format mag_data_bartels_BBBB_BBBB.hdf where BBBB is the four-digit Bartel interval.

The CD-Write Once KD and KW number along with the corresponding time span is as follows:

KD#	KW#	TIME SPAN
KD022379	KW000208	12/27/1997 - 03/12/2004

ACE Data Processing Levels

Contents

Data Telemetry and Level 0 Data Processing

The ACE spacecraft Command and Data Handling (C&DH) system gathers data from the instruments and formats the data into minor and major frames. One minor frame (996 bytes, including sync codes, headers and R-S check symbols) is read into the C&DH system each second and there are 16 minor frames per major frame. The C&DH system also gathers data from various analog sensors and digital telltales, from the sun sensors and star sensor, and fr the command system, etc. Most of the time the spacecraft is not in touch with the ground facilities and these data are stored in an onboard Solid State Data Recorder (SSDR). Typically one contact per day is initiated by ground facilities and lasts roughly two to four hours. The SSDR is large enough to allow contacts to be spaced by more than 50 hours when necessary. The SSDR contents are read out to the ground at a rate exceeding 10 minor frames per second while current data are being simultaneously telemetered to the ground and stored in the SSDR for the next contact. The telemetry data are formatted into two virtual channels (real-time and playback) and received by the Caltech Jet Propulsion Laboratory Deep Space Network (DSN). The telemetry data are then forwarded in near real-time via the Internet to the ACE Integrated Mission Operations Center (IMOC) at the Goddard Space Flight Center (GSFC). There the data are reviewed in near real time for purposes of monitoring spacecraft and instrument status. At the end of each spacecraft contact, the DSN forwards the telemetry data to the ACE Science Center via ftp.

The data then undergo level zero processing (per NASA's standard terminology) as soon as all the data contained within the current 24 hour time frame have been received. In level zero processing, duplicate data are removed from the data stream, data are time ordered, and data quality and accounting summaries are appended. The data are formatted into a 24-hour Science Routine Data Set File (Level 0 data file). Production of Level 0 data is now the responsibility of the ACE Science Center at Caltech.

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Level 1 Data Processing

At the ACE Science Center, the data undergo level one processing, usually within a few days of receipt. In level one processing, the data are separated out by instrument and each instrument data set is formatted (using the NCSA HDF st ard) in a fashion which is both consistent with the other instruments and customized to meet the special requirements of that data set and team. At this point in the processing, i.e., in level one, the data are supplemented

with ancillary data including position, attitude, and spin phase of the spacecraft; command history and comments; calibration of the spacecraft clock; and documentation of the data items. Excepting the documentation, these ancillary data are all received by the Science Center from the IMOC. The level one data are archived at the Science Center and a copy is transmitted to the National Space Science Data Center (the NSSDC) for long term archiving. Each instrument team receives a copy of all the level one data, including, of course, that from their own instrument.

In addition to formatting, level one processing includes those data processing steps which are judged to be of sufficient simplicity that they can be understood, defined, and coded before launch, and do not require iterated processing with increasing experience. Examples of such steps include decompression of compressed rate scaler data and proper time labeling of data which are buffered for a number of minor frames within the instrument before readout. A counter-example (a process which clearly does not belong in level one) is application of calibration data to convert digital pulse heights from detector signals to engineering units. Experience indicates that calibrations are often adjusted repeatedly to improve resolution based on extended iterative study of the instrument response.

In parallel with the level one processing, the level zero data is processed to yield Browse Parameters. Browse parameters are a subset of ACE measurements which allow monitoring of the solar wind and large-scale particle and magnetic field behavior. They also allow the selection of time intervals of particular interest for more intensive study. Since it is considered important to distribute first-order ACE results as soon as possible, the browse parameters are delivered to the public domain immediately, at the expense of full verification.

Click here for more detailed level 1 data documentation.

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Level 2 Data Processing

Data processing beyond Level 1 is the responsibility of the individual instrument teams. Level 2 processing includes such operations as application of calibration data and detector response maps, organization of data into appropriate energy and time bins, and application of ancillary data (for example, conversion of magnetic field vectors to useful coordinate systems using the spacecraft attitude data). The Science Center attempts to facilitate these efforts within its resources, especially when high-level processing involves multiple instrument teams. For example, much of the anisotropy/flow data for the particle instruments, in particular for the Electron, Proton, and Alpha-particle Monitor (EPAM), will be computed in terms of the direction of the magnetic field. Thus the EPAM team will need high level results from the MAG team to do high level EPAM analysis. The Science Center can facilitate data sharing and communications with its substantial data storage capabilities and its data formatting experience. Another example is the high level processing for the Cosmic Ray Isotope Spectrometer, CRIS. Four institutions are involved in this processing, each contributing expertise and experience in a different sub-assembly of this very complex instrument. Communications and iteration of the data processing are being facilitated by the Science Center for this team.

Each instrument team is required to deliver level two data back to the Science Center, which will then make the data available to the other instrument teams, the space science community (as required by NASA), and the NSSDC for long term archiving. Delivery of level two data back to the Science Center is expected to begin about three months after the spacecraft enters orbit about the L1 Lagrangian point. Thereafter, roughly a two month lag time is expected between receipt of level one data by the instrument teams and delivery of level two data back to the Science Center. However, these delivery schedules may require revision if instrument checkout and debugging take longer than expected. In addition, the level two dataset is expected to be evolutionary, in the sense that an instrument team may enhance their level two data with additional products in the future, as the sophistication of their analysis increases.

Access ACE Level 2 data.

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Ancillary Data

Ancillary data is data provided by various sources in addition to what is telemetered from the spacecraft. This inc[illegible]es attitude and position solutions from Flight Dynamics and onboard clock calibration data from the Flight Operations team. These data are either folded into the Level 1 data at the Science Center, and/or provided to the instrument teams in addition to the Level 1 data.

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Our Email Address: asc@srl.caltech.edu

Last Updated: Sep 24, 1998

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ACE Level 2 Data Policy Statement

- ACE data processing beyond level 1 is the responsibility of each instrument team. Level 2 processing includes the application of calibration data and detector response maps, organization of data into appropriate energy and time bins, and transformation of vector data into appropriate coordinate systems.

- The quality of ACE level 2 data is intended to be such that it is suitable for serious scientific study. However, to avoid confusion and misunderstanding, it is recommended that users consult with the appropriate ACE team members before publishing work derived from the data.

- The ACE team has worked hard to ensure that the level 2 data are free from errors, but the team cannot accept responsibility for erroneous data, or for misunderstandings about how the data may be used. This is especially true if the appropriate ACE team members are not consulted before publication. At the very least, preprints should be forwarded to the ACE team before publication.

- The appropriate ACE team members should be acknowledged in any publication derived from the ACE data. Guidelines for acknowledging your use of ACE Level 2 data

- It is requested that the ACE team be informed (eg: by email to asc@srl.caltech.edu) of any presentations and publications that use ACE data, and that preprints and reprints of such publications be sent to the ACE Science Center for inclusion in the library of ACE-related publications.

- The ASC acts as a central facility where all the level 2 data from each instrument is gathered from the instrument teams and converted to a common data format - Hierarchical Data Format (HDF).

- When possible, the ASC ensures that time-averaged level 2 data from different ACE instruments have common time boundaries. This is generally true for hourly and longer time averages, but not for shorter time averages.

- ACE level 2 data in HDF format are archived at the ASC and will also be sent to the NSSDC for long-term archiving. The data will be available to the scientific community from both the ASC and the NSSDC.

- The ASC will provide software and documentation to facilitate access to ACE level 2 data.

- The instrument teams began delivery of level 2 data to the ASC in the 4th quarter of 1998. Testing, verification of the data, and conversion to HDF format has been completed for some instruments, and is in the final stages for others. When level 2 delivery becomes routine, the ASC expects to receive the level 2 data from the instrument teams about two months after the instrument teams receive the level 1 data from the ASC.

- The ACE level 2 data are expected to be evolutionary, in the sense that an instrument team may enhance their

level 2 data with additional products in the future, as the sophistication of the data analysis improves.

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Last Updated: 5 May, 2000

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About MAG Data

MAG Instrument on ACE

The Magnetic Field Experiment (MAG) consists of twin vector fluxgate magnetometers controlled by a common CPU. The sensors are mounted on booms extending 4.19 meters from the center of the spacecraft at opposite sides along the +/-Y axes of the spacecraft. The instrument returns 6 magnetic field vector measurements each second, divided between the two sensors, with onboard snapshot and FFT buffers to enhance the high-frequency resolution.

For more information about the MAG instrument, visit the MAG Home Page, at Bartol Research Institute.

MAG Data Description

Time Data
All level 2 data records for all ACE instruments contain timing information in the same format. The format of the timing information is described here.

MAG level 2 data contains one extra time data item: the spacecraft clock time (32-bit unsigned int), which counts minor frames since the start of the mission.

Interplanetary Magnetic Field Data
MAG level 2 data is organized into 27 day time periods (Bartels Rotations - roughly one solar rotation period). For each Bartels Rotation, the level 2 data contains time averages of the magnetic field data over the following time periods:

* 16 seconds
* 4 minutes
* hourly
* daily
* 27 days (1 Bartels rotation)

Release notes for MAG level 2 data - provided by the MAG instrument team. All users of MAG data should read these notes.

A data value of -999.9 indicates bad or missing data for the given time period.

Magnetic field vectors are given in the RTN and GSE coordinate systems.

For daily and Bartels rotation averages, only Bmag data is valid. For Br, Bt, Bn, Delta, Lambda, Bgse_x, Bgse_y, and Bgse_z, the fill value (-999.9) is output. Individual vector components on timescales longer than 1 hour are considered to be potentially misleading and have questionable value at 1 AU. For this reason, they are not computed. Values of <|B|> may be more useful, but the user is cautioned to examine the dBrms value for these intervals as large values of dBrms may indicate significant changes in the magnetic field during the averaging interval.

Data error is less than 0.1 nT (where nT is nano-Tesla).

The averaged Mag data, which are all float32, are:

Br - The r component of the magnetic field vector in the RTN coordinate system in nT

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        Bt      - The t component of the magnetic field vector in the RTN
                  coordinate system in nT
        Bn      - The n component of the magnetic field vector in the RTN
                  coordinate system in nT
        Bmag    - The <|B|> magnetic field magnitude in nT
        Delta   - The angle in degrees with 0 at Br/Bt plane + toward Bn
                  (-90 to +90 degrees), i.e. the RTN latitude
        Lambda  - The angle in degrees with 0 at Br and + toward Bt
                  (0 to 360 degrees), i.e. the RTN longitude
        Bgse_x  - The x component of the magnetic field vector in the GSE
                  coordinate system in nT
        Bgse_y  - The y component of the magnetic field vector in the GSE
                  coordinate system in nT
        Bgse_z  - The z component of the magnetic field vector in the GSE
                  coordinate system in nT

        dBrms   - RMS values of underlying high-resolution measurements in nT.
                  This is the rms variation of the vector over the time
                  interval, calculated as follows:
                        1) calculate the average magnitude of each of the three
                           components of the vector, over the time interval.
                        2) for each component, average the square of the
                           difference between the measurement and the average
                        3) add the averages from the three components
                        4) take the square-root of the result.
                  i.e.

                        dBrms = sqrt(sum_i <( B_i -  )^2>)

                  For the 16-second averages, dBrms is calculated using the
                  the highest resolution data (3 vectors/second, from one of the
                  two sensors). For the 4-minute and hourly averages, the 16-second
                  averages are used as input to the calculations.

        sigma_B - The variance of |B| over the time interval, in nT.

                  i.e. sigma_B = sqrt(<(|B|-<|B|>)^2>).

                  If sigma_B/<|B|> is small, there was little variation
                  during the time period.
                  If sigma_B/<|B|> is large , there was much variation
                  during the time period.

                  sigma_B is only calculated for the 4-minute and hourly
                  averages. It is calculated using the 16-second averages
                  as input.

Quality information about the Mag data, float32 except as noted:

        fraction_good
                  - Fraction of the timing period for which there was data
                    available for the time period.

        N_vectors- (in int32) Number of 16 second vectors that were included
                    in the average.

The data quality for the period (int32); data of type 2 have been excised,
i.e. replaced with fill data (-999.9):

        Quality = 0 Normal data
                = 1 Spacecraft Maneuver & subsequent high-nutation period (~4 hr)
                = 2 Bad data/missing data

ACE spacecraft position, in GSE coordinate system (float32):
```

```
        pos_gse_x - The x-component of the spacecraft position,
                    in GSE, in km.
        pos_gse_y - The y-component of the spacecraft position,
                    in GSE, in km.
        pos_gse_z - The z-component of the spacecraft position,
                    in GSE, in km.
```

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Last Updated: 11 November, 1998

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ACE/MAG Release Notes:

The following are cummulative release notes for the ACE Magnetic Field Instrument (MAG) Level-2 datasets. As new datasets are released or [illegible] datasets are processed, this file will be updated.

August 10, 1998:

Release of DOY 1 -- 120 of 1998, Version 1 of MAG Level-2 data in RTN coordinates. Each data file contains documentation of maneuver times, field components in RTN, |B|, latitude and longitude, and RMS values of underlying high-resolution measurements.

Data are 16-second averages of the vector measurements. The datafiles are processed based on daily files of Level-1 data. Bad or missing data is filled with -999.9, except at beginning or end of day when data is not supplied. Time tags are approximate and good to better than 16 seconds. ACE frame counts are exact and mark the beginning of the data averaging interval.

Use of single initial zeroes file for all of 120 day interval. Results good to 1/3 nT.

Final alignment of sensors not yet performed, but correction expected to be smaller than above.

Release of daily graphics files included at same time.

Release of revised Level-2 data anticipated shortly.

March 5, 1999

Release of DOY 121 -- 300 of 1998, Version 1 of MAG Level-2 data in RTN coordinates.

Formats for data files are the same as before, except that headers are extended to include maneuver times, spacecraft location at beginning and end of the interval, and spacecraft attitude at same times.

Release of daily graphics files included at same time. Graphics revised to include above additional header material.

Two days (DOY 263 and DOY 278) remain suspect with possibly analysis issues for Range-0 (low |B|) data. Further analysis of these days is ongoing.

A revision of 1998 (Version 2) will be filed at a later date.

August 10, 1999

Release of DOY 301 -- 365 of 1998, Version 1 of MAG Level-2 data in RTN coordinates.

Formats for data files are unchanged.

Release of daily graphics files included at same time.

August 12, 1999

Release of DOY 1 -- 30 of 1999, Version 1 of MAG Level-2 data
in RTN coordinates.

.se of daily graphics files at same time.

Data and plot formats are unchanged.

September 29, 1999

Release of DOY 31 -- 109 of 1999, Version 1 of MAG Level-2 data
in RTN coordinates.

Release of daily graphics files at same time.

October 18, 1999

Release of DOY 152 -- 265 of 1999, Version 1 of MAG Level-2 data
in RTN coordinates.

Release of this data interval is out of sequence with previous
release in order for ACE to support Cassini flyby of Earth.

Release of daily graphics files at same time.

October 21, 1999

Release of DOY 110 -- 151 of 1999, Version 1 of MAG Level-2 data
i TN coordinates.

Release of this data interval brings MAG release to DOY 265 of 1999.

Release of daily graphics files at same time.

December 10, 1999

Two problems (one real and one potential) have come to the attention
of the ACE/MAG team and must be acknowledged for the sake of those
using MAG data.

1) Although the ground processing software (Level-2, Browse, and RTSW codes) was designed to use -999.9 as badpoint values so that "0" values should never appear in the dataset, it is now known that Level-2 data does possess some frames with these values. They appear in 1/2 major frame subsets and the source is not yet known.

2) The sunpulse anomaly of June 1999 may result in minor errors in the spin period, which can result in spin tones and errors in despun coordinate systems (RTN, GSE, etc.). If so, the errors will be small. The dates and times for when this anomaly may influence the data are from 13:50 June 5 until 16:00 June 12.

March 1, 2000

Release of DOY 266 of 1999 -- DOY 57 of 2000, Version 1 of MAG Level-2
data in RTN coordinates.

Release of this data interval brings MAG release to DOY 057 of 2000.

Release of daily graphics files at same time.

Source of |B|=0 values not yet determined, but such values should be checked for in any analysis and the points treated as bad values.

June 23, 2000

Release of DOY 58 of 2000 -- DOY 169 of 2000, Version 1 of MAG Level-2 data in RTN coordinates.

Release of daily graphics files at same time.

October 13, 2000

Release of DOY 170 of 2000 -- DOY 271 of 2000, Version 1 of MAG Level-2 data in RTN coordinates.

Apparently unphysical RMS signatures during maneuver of DOY 230 that do not show up as shifts in mean field. Source not known at present.

There continue to be intervals (generally short lasting a few hours to a day) when the apparent zero level of the combined spacecraft + instrument signal abruptly changes by < 0.5 nT (usually). Since the shift sometimes occurs primarily along the spin axis of the spacecraft, we are not confident that we always resolve these events and the user should remain aware that at present such events may remain unresolved. The source(s) of these events is under investigation.

Release of daily graphics files at same time.

April 5, 2001

Release of DOY 272 of 2000 -- DOY 353 of 2000, Version 1 of MAG Level-2 data in RTN coordinates.

The source(s) of spacecraft field remain unresolved. Zeroes are quite good for all three instrument ranges of interest at L1. No strikingly anomalous signals are seen in this time, but continued analysis in scientific efforts may always reveal previously unknown problems. B=(0,0,0) values in processed data appear to persist, but source has never been identified and they must be treated as bad data.

Release of daily graphics files at same time.

April 6, 2001

Release of DOY 354 of 2000 -- DOY 040 of 2001, Version 1 of MAG Level-2 data in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

May 18, 2001

Release of DOY 41 of 2001 -- DOY 120 of 2001, Version 1 of MAG Level-2 data in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

January 4, 2002

Release of DOY 121 of 2001 -- DOY 166 of 2001, Version 1 of MAG Level-2 in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

January 7, 2002

Release of DOY 167 of 2001 -- DOY 365 of 2001, Version 1 of MAG Level-2 data in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

Odd behavior during maneuver on DOY 205 (July 24, 2001). RMS levels change by ~0.5 nT in step fashion several times although instrument range does not change. Probably unresolved spacecraft signal, but data is not guaranteed during maneuvers.

ACE Science Center informs us that:

> Larger than usual number of missing minor frames in telemetry for DOYs 351 (~0.6%) and 352 (~4%). This does not interfere with processing or overall data quality of MAG data.
>
> Attitude data for DOYs 356-360, inclusive, inaccurate to ~1 degree due to errors in the star scanner.

J 16, 2002

Release of DOY 248 of 1997 -- DOY 365 of 1997, Version 1 of MAG Level-2 data in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

MAG was only instrument on and taking data at this time, so there has been little call for the 1997 data.

Days 342-347 and 349 are missing due to halo insertion maneuver. There was no science telemetry at this time.

The first 11 days of flight are difficult to analyze due to many reasons. However, at least some fraction of these will be released shortly following further analysis.

Several days show anomalous behavior:

> Days 250-253 show odd 30-minute oscillation similar to that seen during first 11 days of mission.
>
> Odd stepping in fluctuation level on days 258, 262, 266, 267, and 353.
>
> Zeroes appear to step briefly on days 276-277, 289, 302-304, 316-317, and 332-333.
>
> Both of the above effects are at the < 0.5 nT level.
>
> Sources of the above behavior have not been identified, but further effort to refine the data will probably reduce or eliminate the effect.

July 17, 2002

Release of DOY 245 of 1997 -- DOY 247 of 1997, Version 1 of MAG Level-2 data in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

ACE was launched on DOY 237 of 1997. Data from launch through DOY 244 shows more rapidly changing zeroes of undetermined origin than is seen in the remainder of the mission to date. A future version of the MAG processing software will better handle this situation. Since this data is not now up to the standards of the ACE/MAG instrument team, we are not releasing these 8 days of data to the general public at this time.

If data from these 8 days are desired, please contact the ACE/MAG team and arrangements can be made to deliver the data in the best form available and at the same time that the appropriate warnings regarding data quality during this time can be provided.

July 29, 2002

Rerelease of DOY 001 of 1998 -- DOY 300 of 1998, Version 1 of MAG Level-2 data in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

This release was motivated by an ASC request to standardize MAG data deposits in a form opiginally established with 1998-301 data. This format contains the complete spacecraft position information that has been standard ever since.

The data released now should be identical to that which was released earlier, but in fact there are small differences. Early in 1998 the data time tag used by the MAG team was approximate. It is now correct. Also, small changes in the computed IMF have resulted from changes in the analysis program. Generally, the changes are small. The largest changes are seen on days 121 through 160 when changes up to 0.15 nT are seen. Generally, but not always, the change results from better zeroes and contains a smaller spin tone.

A formal release of Version 2 data is still intended that will contain additional changes to the processing, but for now no version number other than 1 is attached to this data.

August 4, 2002

Release of DOY 001 of 2002 -- DOY 146 of 2002, Version 1 of MAG Level-2 data in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

Zeroes processing uncovered interesting oscillations in the spacecraft field starting ~ day 30 and continuing to at least day 73. The period of the oscillations is ~8 days. The amplitude is ~0.12 nT at both sensors.

Data continue to have occasional B=(0,0,0) and Bmag=0 values arising from unresolved processing source. Values appear in 8-s blocks with multiple contiguous 8-s blocks possible. User is advised to test for this condition as well as the badpoint flag -999.9 and treat both as

unphysical.

September 16, 2002

Release of DOY 147 of 2002 -- DOY 203 of 2002, Version 1 of MAG Level-2 data in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

June 26, 2002 (DOY 177) from ~9:30 to ~11:00 UT contains telemetry errors. Resulting MAG analysis yields B=(0,0,0) and Bmag=0 arising from unresolved processing source. User is advised to test for this condition as well as the badpoint flag -999.9 and treat both as unphysical.

September 18, 2002

Release of DOY 204 of 2002 -- DOY 208 of 2002, Version 1 of MAG Level-2 data in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

January 4, 2003

Release of DOY 209 of 2002 -- DOY 235 of 2002, Version 1 of MAG Level-2 data in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

January 6, 2003

Release of DOY 236 of 2002 -- DOY 262 of 2002, Version 1 of MAG Level-2 data in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

May 5, 2003

Release of DOY 264 of 2002 -- DOY 343 of 2002, Version 1 of MAG Level-2 data in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

September 23, 2003

Release of DOY 344 of 2002 -- DOY 032 of 2003, Version 1 of MAG Level-2 data in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

October 22, 2003

Release of DOY 33 of 2003 -- DOY 059 of 2003, Version 1 of MAG Level-2 data in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

October 23, 2003

Release of DOY 60 of 2003 -- DOY 086 of 2003, Version 1 of MAG Level-2
ta in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

9.5 hour data gap on day 71 (March 12).

October 30, 2003

Release of DOY 87 of 2003 -- DOY 113 of 2003, Version 1 of MAG Level-2
data in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

November 2, 2003

Release of DOY 114 of 2003 -- DOY 140 of 2003, Version 1 of MAG Level-2
data in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

November 21, 2003

Release of DOY 141 of 2003 -- DOY 167 of 2003, Version 1 of MAG Level-2
data in RTN coordinates.

lease of daily plots in RTN coordinates at same time.

Note: Less than 2 hours of data are missing on day 142, from ~15:10
until 17:00 UT. This is due to spacecraft being in ADC mode. This
data is available upon request by special processing.

December 1, 2003

Release of DOY 168 of 2003 -- DOY 248 of 2003, Version 1 of MAG Level-2
data in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

December 10, 2003

Release of DOY 249 of 2003 -- DOY 302 of 2003, Version 1 of MAG Level-2
data in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

December 12, 2003

Release of DOY 303 of 2003 -- DOY 329 of 2003, Version 1 of MAG Level-2
data in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

March 24, 2004

Release of DOY 330 of 2003 -- DOY 357 of 2003, Version 1 of MAG Level-2
data in RTN coordinates.

lease of daily plots in RTN coordinates at same time.

June 24, 2004

Release of DOY 358 of 2003 -- DOY 72 of 2004, Version 1 of MAG Level-2
data in RTN coordinates.

Release of daily plots in RTN coordinates at same time.

The data on several days has a low-level noise of undetermined source.
It may be an interplanetary source, or it may not. Those days are
day 358 of 2003 and days 56, 57 of 2004. It also observed on day 77
of 2004 which will be releases shortly. The noise is most evident in
the |B| when |B| is otherwise very steady and the component fluctuations
are low. This is not the first time this signal has been detected, but
with solar minimum it may become more evident.

--- CWS

Hierarchical Data Format

HDF is a library and platform independent data format for the storage and exchange of scientific data. It includes C, Fortran, and Java calling interfaces, and utilities for analyzing and converting HDF data files.

HDF is developed and supported by NCSA, and is freely available. It is used world-wide in many fields, including Environmental Science, Neutron Scattering, Non-Destructive Testing, and Aerospace, to name a few.

Scientific projects that use HDF include NASA's Mission to Planet Earth, and the DOE's Accelerated Strategic Computing Initiative.

All ACE data available to the scientific community (Browse, Level 1, Level 2, ancillary) is formatted using HDF.

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* NCSA HDF Home Page - Information, Support, and Software for all platforms from the Hierarchical Data Format (HDF) Group of NCSA.

* HDF News, Libraries and Browsers - For Win95/NT and Macintosh platforms.

* Automatic HDF Code Generation using a perl script (hdfgen.pl) - This script, written at ASC, automates many of the steps required to write C programs which read/write HDF data files.

* A description of how ACE Level 2 data is implemented in HDF. Uses SIS Level 2 data as an example.

* The DIAL Experimental Data Server that is being used at the ACE Science Center to allow web-browsing of HDF data files was jointly developed by Hughes STX and the National Center for Supercomputing Applications under contract to NASA/GSFC. The ACE Science Center has customized the software for the ACE dataset.

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Coordinate Systems for ACE

The ISTP Project provides a Fortran library for conversion between these coordinate systems.

A good description of how to make transformations between the different coordinate systems can be found in a paper by M. A. Hapgood, "Space physics coordinate transformations: A user guide", in Planetary and Space Science, Vol. 40, No. 5, pp. 711-717, 1992.

J2000 GCI

Geocentric inertial reference frame using the Julian Epoch of Jan. 1, 2000.
At the Julian Epoch,
X = Earth's mean vernal equinox
Z = Earth's mean spin axis

RTN - Radial Tangential Normal

Spacecraft centered coordinate system.
R = Sun to Spacecraft unit vector
T = (Omega x R) / | (Omega x R) |
where Omega is Sun's spin axis (in J2000 GCI)
N completes the right-handed triad

GSE - Geocentric Solar Ecliptic

X = Earth-Sun Line
Z = Ecliptic North Pole

GSM - Geocentric Solar Magnetospheric

X = Earth-Sun Line
Z = Projection of dipole axis on GSE YZ plane

HSEa - Heliocentric Solar Ecliptic (Inertial)

X = First Point of Aries
Z = Ecliptic North Pole

HSEb - Heliocentric Solar Ecliptic (Earth Oriented)

X = Sun-Earth Line
Z = Ecliptic North Pole

HS - Heliocentric Solar

X = Intersection between solar equator and solar central meridian as seen from Earth
Z = North Pole of solar rotation axis

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